air on top of the jet of flame, and in this manner protected the roof. As the coldest gases tend to seek the lowest portion of the chamber, it is somewhat difficult to see just how this argument is tenable. At the same time the waste gases reaching this large port should be somewhat hotter than those reaching the smaller gas-port at a lower level. This difference in temperature might not be very great, as the vertical distance between the ports is not great.

However, a much larger proportion of the waste gases would be drawn off through this port, and, as a result, the air would be preheated to a higher temperature than the gas. With this construction the gas regenerator is strangled; that is, it cannot obtain the proportion of the waste gases necessary to preheat the incoming gas to the same temperature as the air supply, unless a considerable draft differential is available to force a correct division of the waste gases. A further disadvantage of this type of head is the tendency of the bath to chill at the incoming end with irregular reversals.

Port erosion, increasing the area of the gas-port and reducing the jet velocity, has been very troublesome, as a point is speedily reached at which the proper sintering of the bottom becomes impossible. This entails shutting down the furnace for repairs with consequent loss of production. Water-cooled ports are a partial cure for the trouble; they increase the time between port repairs, but they do not contribute to the correct division of the waste gases between the regenerators.

Another result of the improper division of the waste gases between the regenerators is a tendency for the furnace to work cold; that is, the time per melt is increased, owing to the improper combustion conditions produced. At the same time, the wear upon

the furnace is greater, particularly upon the roof, gas ports, cinder line, etc.

The durability of any material exposed to heat is dependent upon its ability to conduct this heat away from the heated end and emit a sufficient amount of heat from its cool end to prevent the hot end from overheating. When the hot end commences to absorb heat faster than the cool end can emit heat, the temperature of the hot end will commence to rise until it fails.

Water cooling supplies a more rapid method of removing heat than air currents; it is particularly valuable in those cases where